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| APPLICATION NO.  | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO.         | CONFIRMATION NO.       |
|--|-------------|----------------------|-----------------------------|------------------------|
| 10/538,787   | 09/19/2005  | Michael Haubs        | 05587-00383-US              | 4294                   |
| 23416 7590 09/07/2007<br>CONNOLLY BOVE LODGE & HUTZ, LLP<br>P O BOX 2207<br>WILMINGTON, DE 19899 |             |                      | EXAMINER<br>O DELL, DAVID K |                        |
|  |             |                      | ART UNIT<br>1625            | PAPER NUMBER           |
|  |             |                      | MAIL DATE<br>09/07/2007     | DELIVERY MODE<br>PAPER |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

|                              |                               |                              |  |
|------------------------------|-------------------------------|------------------------------|--|
| <b>Office Action Summary</b> | Application No.<br>10/538,787 | Applicant(s)<br>HAUBS ET AL. |  |
|                              | Examiner<br>David K. O'Dell   | Art Unit<br>1625             |  |

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 1 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 03 July 2007.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1,2 and 4-11 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2 and 4-11 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

### **DETAILED ACTION**

1. Claims 1-2, 4-11 are pending in the application.
2. This application is national stage application of PCT Application PCT/EP03/14122, which was filed on December 12, 2003. The international application claims priority to a German application 10258663.2 filed on December 13, 2002.

### ***Response to Arguments***

3. The objections to the specification are withdrawn, since the amendment obviates them. The rejection of claim 3 is withdrawn, since the claim has been canceled. With respect to the 103 rejections of the remaining claims, applicant's arguments filed July 3, 2007 have been fully considered but they are not persuasive. In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that applicant has stated "Kondo is significantly different in that this reference teaches feeding formaldehyde solution directly into the distillation column, totally unlike the claimed invention herein." (Remarks pg. 7) however this aspect of Kondo is clearly the same as the instant case. Applicant's attention is directed claim 9, ".....together with a feed line for fresh formaldehyde solution, opens into vii) a tubular reactor (D) which opens via a draw line viii) into the upper section of the reaction column (A)." Clearly reaction column (A) is a distillation column (see the discussion of the nature of this column at 4), and as per Kondo: "A solution rich in formaldehyde drawn from the bottom of the distillation column 2 is partially vaporized by an evaporator 4 and a portion is returned through a flow pathway 3 to the bottom the of the distillation column 2, while the remainder is simultaneously supplied through a flow pathway 5 to a reactor 6 where it is brought into contact with a catalyst and is then supplied through a flow pathway 7 to the

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**middle part of the distillation column 2.”** Here it is clear that applicant’s “tubular reactor (D)” is the reactor 6 of Kondo and the reaction column (A), is the distillation column 2 of Kondo. The real differences between those of the instant case and the apparatus and process of Kondo in view of several other references were discussed previously and are reproduced here in this action. It is very clear that the instant invention is no more than the obvious variation of an old invention.

***Claim Rejections § 35 U.S.C. 103***

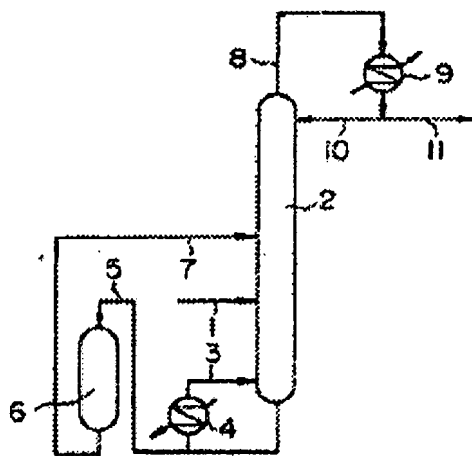
The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1, 5, & 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kondo et. al. Japanese Patent Application H03-145485 (translation provided). The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

- A). Determining the scope and contents of the prior art.
- B). Ascertaining the differences between the prior art and the claims at issue.
- C). Resolving the level of ordinary skill in the pertinent art.
- D). Considering objective evidence present in the application indicating obviousness or nonobviousness.

A) Kondo et. al. teaches an apparatus and a process for the preparation of trioxane. This description is most pertinent and Figure 1 is reproduced for applicant’s convenience:



"Figure 1 is a flow sheet that shows one state of the present invention. An aqueous formaldehyde solution is supplied through a flow pathway 1 to a distillation column 2. A solution rich in formaldehyde drawn from the bottom of the distillation column 2 is partially vaporized by an evaporator 4 and a portion is returned through a flow pathway 3 to the bottom the of the distillation column 2, while the remainder is simultaneously supplied through a flow pathway 5 to a reactor 6 where it is brought into contact with a catalyst and is then supplied through a flow pathway 7 to the middle part of the distillation column 2."

B) The only difference between the instant case and the prior art, is that in the former the applicant relies on a "reaction column A", which might be reactive distillation column. We are left with no further description of the "reaction column", but from the figure provided it appears

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to be a fractionating column of some type. The examiner has concluded that this column is some kind of reactive distillation column.

C) The level of ordinary skill is someone familiar with the basic principles of chemical engineering.

D) The use of reactive distillation columns is well known in the art as evidenced by the opening statement in a recent review (R. Taylor, R. Krishna *Chemical Engineering Science* 2000, 55, 5183-5229.):

“The versatility of the fractionating column in the dual role of continuous reactor and separator as applied to chemical processing is well established. Berman, Isbenjian, Sedoff and Othmer (1948a) The quote with which we begin this review appeared in print more than five decades ago!”

Thus one of ordinary skill in the art would have been immediately aware of the use of such columns and their application to the process at hand. Kondo describes the column of his invention as follows:

“The distillation column used in the present invention may be a tray tower type, such as a single-stage bubble cap type, sieve tray type, flexitray type, etc., or a packed column type, such as a Raschig ring type, McMahon type, etc.”

This description could obviously include columns that fit the drawing of applicants “reaction column A”. In addition, claim 5 is obvious since Kondo et. al. teach that:

“The amount of these catalysts used is not especially limited, but normally, there is a tendency for byproducts to increase as the amount of catalyst increases.”....“Accordingly, in the case of a homogeneous catalyst system, the concentration of the catalyst can be reduced increasing the retention time in the reactor and this is advantageous against corrosion.”

Thus one would expect a low concentration of catalyst to be advantageous. As to the nature of the catalyst itself (claim 8), Kondo et. al. teach:

“For the acid catalyst used in the present invention, a mineral acid, such as sulfuric acid, phosphoric acid, boric acid, etc., or an organic acid, such as p-toluene sulfonic acid, 1,5-naphthalene disulphonic

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acid, etc., may be used, **but the use of a solid inorganic or organic acid catalyst is preferred.** For the solid inorganic acid catalyst, an inorganic oxide complex, such as acid clay, hydrogenated clay, silica, alumina, silica-magnesium, alumina-boria, etc.; these materials impregnated or mixed with sulfuric acid, phosphoric acid, boric acid, etc.; inorganic acid salts, such as sulfuric acid salts, phosphoric acid salts, boric acid salts, etc., of metals such as nickel, iron, cadmium, potassium, etc.; these materials impregnated in silica gel, diatomaceous soil, silicon carbide, etc.; montmorillonite (Type H), Ti-montmorillonite, etc., may be used. **Examples of the solid organic acid catalyst are ion exchange resins that have an sulfonic acid base, fluoroalkane sulfonic acid base, etc."** (emphasis added)

Thus the catalyst recited in claim 8 is the preferred catalyst of the invention of Kondo et. al.

5. Claims 2 & 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kondo et. al. Japanese Patent Application H03-145485 (translation provided) in view of Buchert et. al. GB Patent 1,172,557. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

- A). Determining the scope and contents of the prior art.
- B). Ascertaining the differences between the prior art and the claims at issue.
- C). Resolving the level of ordinary skill in the pertinent art.
- D). Considering objective evidence present in the application indicating obviousness or nonobviousness.

A) Determining the scope and contents of the prior art. Kondo et. al. teach the apparatus and process as described above (Office action at 4). Johnson et. al. teach the same process and apparatus that clearly encompasses that of the instant case. More importantly Buchert et. al. teaches that the residence time in such a reaction process should be 2 minutes to 2 hrs.:

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In the process according to the invention the mean residence time of the aqueous formaldehyde solution in the reactor should be from 2 minutes to 2 hours, advantageously 10 to 100 minutes, preferably 10 to 50 minutes. The mean residence time of the aqueous formaldehyde solution in the reactor may easily be determined from the ratio of the amount of reaction mixture in the reactor to the amount of distillate leaving the reactor per unit time.

Buchert et. al. also teach that this process is particularly suited to continuous operation and that the amount fresh formaldehyde fed into the reactor is important and depends on products exiting the reactor:

40 to 70%. If the same amount of water as that introduced into the reactor together with fresh formaldehyde is distilled off together with the trioxane at the head of the column, the mixture of formaldehyde and water which is obtained at the bottom of the column may be directly recycled to the reactor in liquid form or as a vapor. This embodiment of the process is therefore particularly suitable for continuous operation. It also prevents excessive concentration of the synthesis mixture in the reactor and the formation of insoluble substances, such as paraformaldehyde. If however less water is distilled off in the column than is introduced into the reactor together with fresh formaldehyde, there is obtained at the bottom of the column a formaldehyde-water mixture which contains less formaldehyde than the starting material and which therefore cannot be recycled to the reactor until it has been concentrated in an appropriate manner.

B). **Ascertaining the differences between the prior art and the claims at issue.** The prior art teaches a range of times that overlaps with applicants in claim 4. Buchert et. al. teach 2 minutes to two hours residence time. The instant case teaches 1 m to 20 minutes residence time. The prior art teaches a general rule about the amount of formaldehyde feed to apply to the reactor. Claim 2 teaches a broad range of feed ratios.



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C) The level of ordinary skill is someone familiar with the basic principles of chemical engineering.

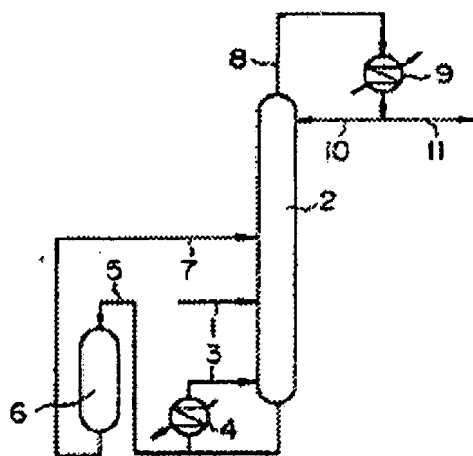
D). **Considering objective evidence present in the application indicating obviousness or nonobviousness:** Clearly the residence time recited in claim 4 overlaps with the residence time taught by Buchert et. al. As to the ratio of fresh formaldehyde added to the reactor, Buchert teaches that fresh reagent should be added if products are being removed, and while no specific ratios are mentioned they would be obvious.

6. Claims 6, 7, 9, 10 & 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kondo et. al. Japanese Patent Application H03-145485 (translation provided) in view of Schmidt et. al. German Patent Application DE 3,328,126 A1. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

- A) Determining the scope and contents of the prior art.
- B) Ascertaining the differences between the prior art and the claims at issue.
- C) Resolving the level of ordinary skill in the pertinent art.
- D) Considering objective evidence present in the application indicating obviousness or nonobviousness.

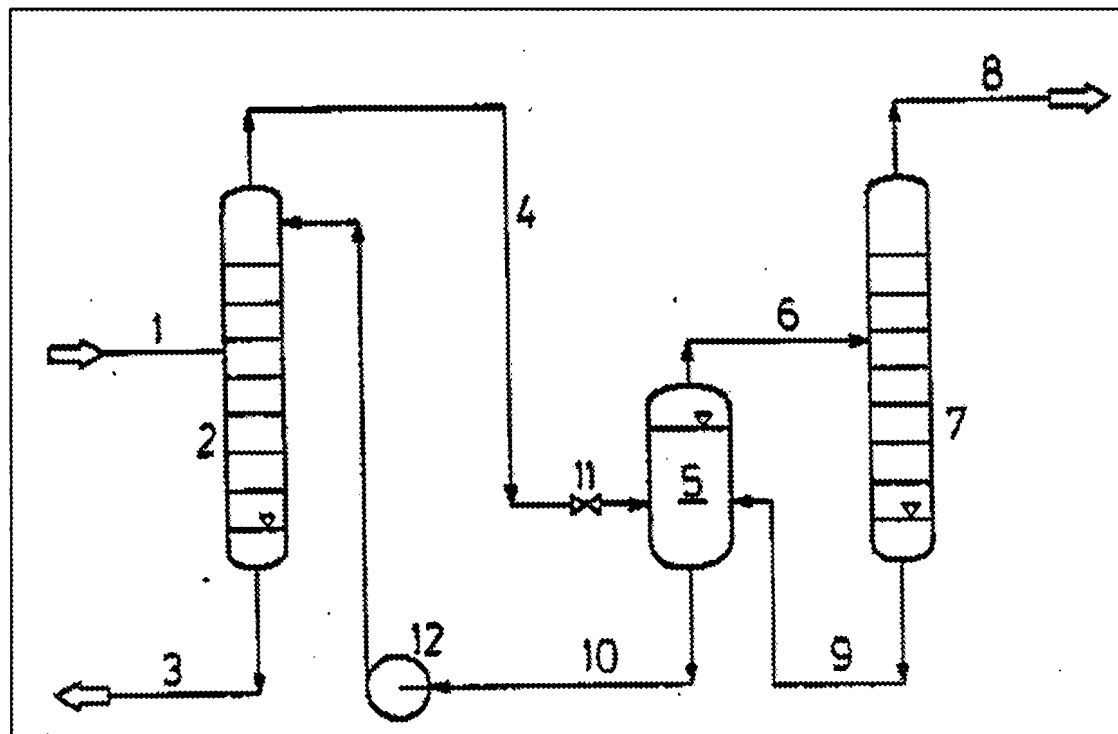
A) **Determining the scope and contents of the prior art:** Kondo et. al. teaches an apparatus and a process for the preparation of trioxane. This description is most pertinent and

Figure 1 is reproduced for applicant's convenience:



"Figure 1 is a flow sheet that shows one state of the present invention. An aqueous formaldehyde solution is supplied through a flow pathway 1 to a distillation column 2. A solution rich in formaldehyde drawn from the bottom of the distillation column 2 is partially vaporized by an evaporator 4 and a portion is returned through a flow pathway 3 to the bottom the of the distillation column 2, while the remainder is simultaneously supplied through a flow pathway 5 to a reactor 6 where it is brought into contact with a catalyst and is then supplied through a flow pathway 7 to the middle part of the distillation column 2."

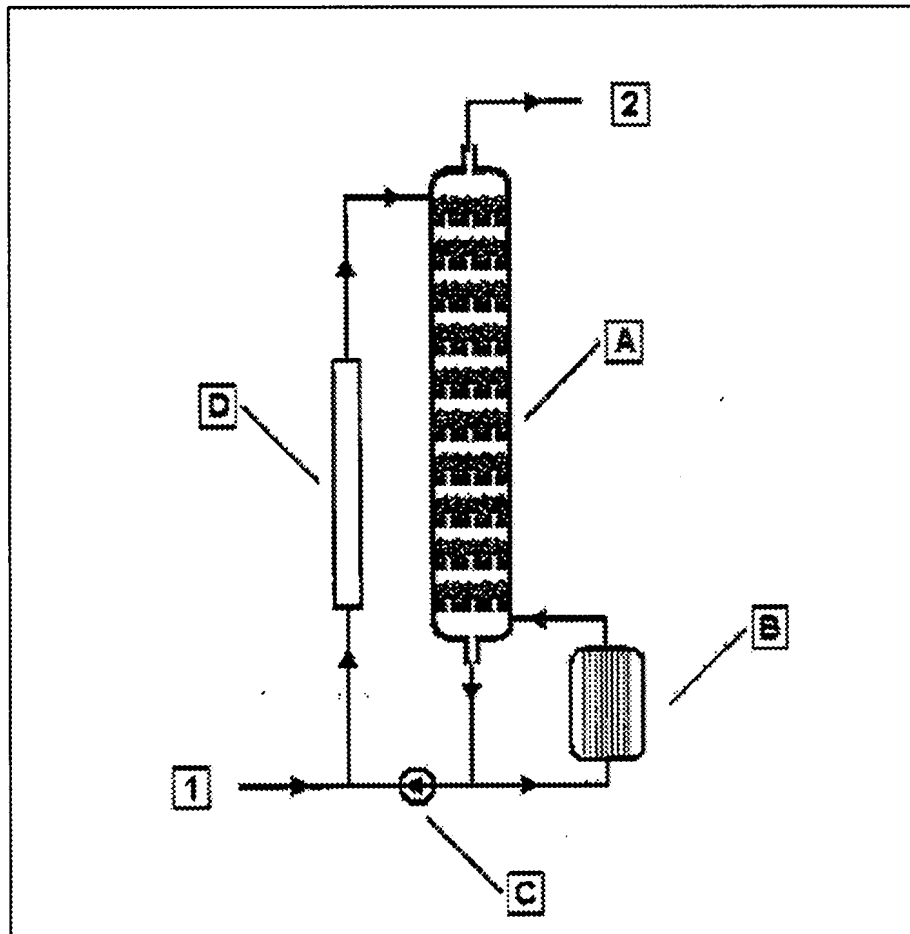
Schmidt et. al. teach a similar apparatus and process operated above atmospheric pressure and using gaseous formaldehyde stemming from a distillation column. The apparatus is illustrated graphically below:



B). Ascertaining the differences between the prior art and the claims at issue:

The apparatus of the instant case is shown below for discussion purposes:

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The difference between the apparatus and process of Kondo and those of the instant case are twofold: Kondo does not mention the operation of his process at pressure higher than atmospheric and does not mention a separate source of formaldehyde.

The difference between the apparatus and process of Schmidt and that of the instant case is this: Schmidt et. al. use three stages with two distillation columns and one reaction zone.

- C) C) **Resolving the level of ordinary skill in the pertinent art:** The level of ordinary skill is someone familiar with the basic principles of chemical engineering.
- D) **Considering objective evidence present in the application indicating obviousness or nonobviousness:**

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One could view the apparatus of Kondo as essentially the same except lacking the separate source of formaldehyde. Based on the work of Schmidt we can see than other sources of formaldehyde could be supplied to the reactor and that the reactor could be operated above atmospheric pressure.

*Conclusion*

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to David K. O'Dell whose telephone number is (571) 272-9071. The examiner can normally be reached on Mon-Fri 7:30 A.M.-5:00 P.M EST.

8. If attempts to reach the examiner by telephone are unsuccessful, the examiner's Primary examiner, Rita Desai can be reached on (571)272-0684. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

D.K.O.

RITA DESAI  
PRIMARY EXAMINER

*R. Desai*  
8/31/07